stars in the *Durchmusterung* with the following results, giving for comparison the magnitudes assigned to them in the *Durchmusterung* and in Carrington's Red Hill Catalogue:—

No. in B. D.		Mag. B. D.	Mag. Carrington.	Mag. Knott.
$+81^\circ$	13	6·5	6·2	6·5
	22	9·2	9·5	9·4
	26	9·5		10·4
	27	8·6	8·7	8·4
	30	8·3	8·0	8·1
	34	8·7	9·1	8·6

The star No. 26 does not appear to have been observed at Red Hill, and the magnitude estimate in the *Durchmusterung* seems to me to be rather too high.

I may note, in concluding, that the Variable was observed on three occasions at Red Hill in the year 1855, the dates of observation and corresponding magnitudes being December 19, 8·0; 21, 8·0; 30, 9·0. The star was probably near minimum at the last epoch.

Knowles Loge, Cuckfield,
1880, *November* 11.

On the Annual Parallax of the Star P III 242. By Robert S. Ball, LL.D., F.R.S., Royal Astronomer of Ireland.

In the *Monthly Notices* vol. xx. p. 8 is a paper by O. Struve "On a Star which would be suitable for a Parallax Series." The star in question is P III 242, and its position for 1879·0 is $\alpha = 3^h\ 59^m\ 30^s$ and $\delta = +37^\circ\ 45'{\cdot}3$. Argelander in his Catalogue of 560 stars had pointed out that P III 242 probably formed a wide binary system with the next following star of his Catalogue 50 *Persei*, on account of the equality in direction and quantity of their proper motions.

Struve remarks also that P III 242 is a double star of Herschel's first class (No. 531 of O. Struve's Catalogue), the components being of 6–7th and 8–9th magnitudes respectively, and 3″ or 4″ distant. The physical connection of the two components of P III 242 appears to be established by their equal proper motions. A fourth star, Arg. zone $+37^\circ$, No. 877 (Mag. 7–8) is south preceding P III 242 at a distance of nearly 4′. This star does not belong to the system formed by P III 242 and 50 *Persei*, for the changes in its position with respect to P III 242 correspond exactly to the proper motion of the latter. "This star, therefore," says Struve in conclusion, "would be a very qualified object of comparison for determining the relative parallax of P III 242, for which a considerable amount is indicated

by the proper motion and by the probable physical connection with 50 *Persei* at 15′ distance."

So far as I know, no measures have hitherto been published with the view of testing whether Struve's surmise as to the existence of a parallax for P III 242 could be substantiated. I therefore commenced a series of observations in January 1879 of the distance and position of the comparison star which Struve suggested from the larger star of the pair P III 242. The instrument employed was the South Equatoreal at Dunsink Observatory, with the Pistor and Martin filar micrometer. The methods of observation and of reduction are the same as those employed by Dr. Brunnow and myself in previous investigations. See Parts I., II., III. of the "Dunsink Observations."

In an important feature, however, the observations now to be discussed are very different from those which had previously been made with our micrometer. The distance in this case was no less than 237″±, which is greatly in excess of the distances measured in the regular series of parallax observations contained in our previous publications. Had there been any suitable comparison star nearer to P III 242 I should certainly have preferred it, for the distance 237″ is too great to be measured by our micrometer with the accuracy which can be attained when the distance is only about one or two minutes. From this cause the results of the observations are not so satisfactory as I would wish, though they are quite sufficient to show that P III 242 has no large parallax.

The following are the observations which I have made of the distance and position, corrected for refraction and reduced to the mean places of the stars at the epoch 1879·0:—

Dist. and Pos. of A.Z.+37°, No. 877 from P III 242.

Date 1879.	Distance. ″	Position. °	″
Jan. 11	237·558	207	17·35
Feb. 7	237·529	207	23·47
19	237·074	207	13·16
22	237·174	207	16·04
23	237·695	207	10·25
25	237·348	207	16·96
Mar. 1	237·220	207	9·08
19	237·605	207	15·99
Apr. 4	237·422	207	9·27
6		207	14·00
10	237·495	207	15·66
Aug. 14	237·268	207	19·18
22	236·973	207	8·47
23	237·177	207	12·83

Date.	Distance.	Position.	
1879.			
Sept. 17	237·242″	207°	16·28″
Oct. 4	237·151	207	20·24
5	237·203	207	17·28
17	237·497	207	16·14
25	237·315	207	17·12
25	237 049	207	22·83
Nov. 1	236·965	207	8·40
2	237·305	207	17·66
8	237·041	207	19·72
8	237·423	207	21·57
11	237·588	207	12·86
Dec. 3	237·647	206	59·53
5	237·186	207	5·91
17	237·587	207	25·42
18	237·215	207	29·27
24	237·130	207	22·88
1880.			
Jan. 9	236·715	207	20·66

According to O. Struve (loc. cit.), the annual proper motion in right ascension is $+0^s{\cdot}0167$, and in declination $-0''{\cdot}152$. It hence appears that the arc moved over in one year by P III 242 is $0''{\cdot}2497$, while the position angle of the star in the position it will occupy next year measured from the present position is $127^\circ{\cdot}5$. The correction to be applied to the observed distance in order to reduce the observed distance to that between the places at the epoch is $+0''{\cdot}04407$ per annum, while the corresponding correction to the observed position angle is $-3'{\cdot}565$, or in arc $-0''{\cdot}2457$.

The adopted mean distance at the epoch is $237''{\cdot}320$, and the adopted mean position is $207^\circ\ 13'{\cdot}86$.

From the usual formulæ it is found that when $\odot$ is the Sun's longitude, R the Sun's radius vector, and π the annual parallax of P III 242, the correction to be applied to the observed distance to clear it from the effects of parallax is (the figures in brackets denoting logarithms)

$$-[9{\cdot}82787]\pi R \cos(\odot - 174^\circ\ 56'\ 0'')$$

while the corresponding correction of the observed position angle is

$$-[9{\cdot}90007]\pi R \cos(\odot - 142^\circ\ 8'\ 29'').$$

Assuming that $-x$ is the correction to be applied to the

assumed mean distance, while x' is the correction to the assumed value of the proper motion in distance, and κ is a possible difference in the coefficients of aberration of the two stars, then we have from the observations of the distance the following equations of condition:—

P III 242.

Equations of Condition, from Distance.

					Residuals.	Weight.
x	$+ \cdot 0274\, x'$	$+ \cdot 2877\, \pi$	$- \cdot 6038\, \kappa$	$+ \cdot 239 = 0$	$+ \cdot 021$	
	$+ \cdot 1013$	$+ \cdot 5308$	$- \cdot 4011$	$+ \cdot 214 = 0$	$+ \cdot 052$	
	$+ \cdot 1342$	$+ \cdot 6034$	$- \cdot 2791$	$- \cdot 240 = 0$	$- \cdot 374$	$\frac{1}{2}$
	$+ \cdot 1424$	$+ \cdot 6175$	$- \cdot 2466$	$- \cdot 140 = 0$	$- \cdot 268$	
	$+ \cdot 1451$	$+ \cdot 6218$	$- \cdot 2357$	$+ \cdot 382 = 0$	$+ \cdot 257$	
	$+ \cdot 1506$	$+ \cdot 6299$	$- \cdot 2134$	$+ \cdot 035 = 0$	$- \cdot 086$	
	$+ \cdot 1615$	$+ \cdot 6438$	$- \cdot 1684$	$- \cdot 093 = 0$	$- \cdot 209$	
	$+ \cdot 2108$	$+ \cdot 6672$	$+ \cdot 0402$	$+ \cdot 294 = 0$	$+ \cdot 229$	
	$+ \cdot 2546$	$+ \cdot 6338$	$+ \cdot 2212$	$+ \cdot 113 = 0$	$+ \cdot 081$	
	$+ \cdot 2711$	$+ \cdot 6088$	$+ \cdot 2851$	$+ \cdot 187 = 0$	$+ \cdot 172$	
	$+ \cdot 6160$	$- \cdot 5645$	$+ \cdot 3734$	$- \cdot 025 = 0$	$+ \cdot 057$	$\frac{1}{2}$
	$+ \cdot 6379$	$- \cdot 6091$	$+ \cdot 2953$	$- \cdot 319 = 0$	$- \cdot 241$	$\frac{1}{2}$
	$+ \cdot 6407$	$- \cdot 6139$	$+ \cdot 2851$	$- \cdot 115 = 0$	$- \cdot 038$	
	$+ \cdot 7091$	$- \cdot 6739$	$+ \cdot 0113$	$- \cdot 047 = 0$	$+ \cdot 011$	
	$+ \cdot 7557$	$- \cdot 6455$	$- \cdot 1825$	$- \cdot 136 = 0$	$- \cdot 089$	
	$+ \cdot 7584$	$- \cdot 6421$	$- \cdot 1935$	$- \cdot 083 = 0$	$- \cdot 038$	
	$+ \cdot 7913$	$- \cdot 5865$	$- \cdot 3217$	$+ \cdot 212 = 0$	$+ \cdot 249$	$\frac{1}{2}$
	$+ \cdot 8132$	$- \cdot 5352$	$- \cdot 4002$	$+ \cdot 031 = 0$	$+ \cdot 069$	
	$+ \cdot 8132$	$- \cdot 5352$	$- \cdot 4002$	$- \cdot 235 = 0$	$- \cdot 201$	
	$+ \cdot 8323$	$- \cdot 4818$	$- \cdot 4628$	$- \cdot 318 = 0$	$- \cdot 286$	
	$+ \cdot 8351$	$- \cdot 4736$	$- \cdot 4712$	$+ \cdot 022 = 0$	$+ \cdot 053$	
	$+ \cdot 8515$	$- \cdot 4214$	$- \cdot 5187$	$- \cdot 241 = 0$	$- \cdot 211$	
	$+ \cdot 8515$	$- \cdot 4214$	$- \cdot 5187$	$+ \cdot 141 = 0$	$+ \cdot 171$	
	$+ \cdot 8597$	$- \cdot 3935$	$- \cdot 5404$	$+ \cdot 306 = 0$	$+ \cdot 337$	
	$+ \cdot 9199$	$- \cdot 1611$	$- \cdot 6507$	$+ \cdot 368 = 0$	$+ \cdot 405$	
	$+ \cdot 9254$	$- \cdot 1384$	$- \cdot 6561$	$- \cdot 093 = 0$	$- \cdot 051$	
	$+ \cdot 9583$	$+ \cdot 0015$	$- \cdot 6709$	$+ \cdot 309 = 0$	$+ \cdot 357$	
	$+ \cdot 9610$	$+ \cdot 0133$	$- \cdot 6708$	$- \cdot 062 = 0$	$- \cdot 013$	
	$+ \cdot 9774$	$+ \cdot 0835$	$- \cdot 6655$	$- \cdot 147 = 0$	$- \cdot 091$	
	$+ 1 \cdot 0219$	$+ \cdot 2699$	$- \cdot 6150$	$- \cdot 560 = 0$	$- \cdot 480$	

The normal equations deduced by the method of least squares, and making allowance for the weights, are:—

$$+28\cdot000\ x+17\cdot039\ x'-1\cdot1059\ \pi-8\cdot6094\ \kappa+\cdot18500=0,$$
$$+17\cdot039\ x+13\cdot505\ x'-4\cdot1275\ \pi-6\cdot6243\ \kappa-\cdot58021=0,$$
$$-1\cdot1059\ x-4\cdot1275\ x'+7\cdot1845\ \pi+\cdot77499\ \kappa+\cdot85472=0,$$
$$-8\cdot6094\ x-6\cdot6243\ x'+7\cdot7499\ \pi+5\cdot3655\ \kappa-\cdot029128=0.$$

Solving these, we deduce

$$x=-0''\cdot1459\pm0''\cdot08,$$
$$x'=+0\cdot3009\pm0\cdot15,$$
$$\pi=+0\cdot0163\pm0\cdot09,$$
$$\kappa=+0\cdot1405\pm0\cdot12.$$

The sum of the squares of the residuals is 1·2732, from which the probable error of one observation is $\pm0''\cdot15$. The sum of the squares of the absolute terms is 1·4638.

We next proceed to form the equations of condition from the observations of the position angle. In a complete series of measures four observations of the parallel and four of the position angle have been made. Owing to the great distance of the stars, the measurements of the position angle (estimated in arc) are not very satisfactory, and on two occasions (Dec. 3 and Dec. 5, 1879) the discrepancies have attained to very undesirable dimensions. The residual on Dec. 3 is no less than $-1''\cdot332$, but only a weight of $\frac{1}{2}$ attaches to this result, because it was based on but two observations of the parallel and two of the position. The notes at the time of observation are, "Snow and severe frost; low and hazy but tolerably steady." On the next night of observation, Dec. 5, the number of observations was complete, and they were fairly accordant; the notes at the time record, "Good definition; thaw; occasional clouds." The residual on this occasion is $-0''\cdot895$. It will be noticed that these observations occur at dates when the parallax produces but very little effect, the coefficient being $+\cdot2536$ on the first occasion, and $+\cdot2801$ on the second.

The following are the equations of condition which are deduced from the position angle:—

P III 242.

Equations of Condition, from Position Angle.

					Residuals.	Weight.
x	$+\cdot0287\ x'$	$+\cdot6715\ \pi$	$-\cdot4089\ \kappa$	$+\cdot234=0$	$+\cdot103$	
	$+\cdot1028$	$+\cdot7839$	$-\cdot0470$	$+\cdot638=0$	$+\cdot544$	
	$+\cdot1352$	$+\cdot7783$	$+\cdot1186$	$-\cdot082=0$	$-\cdot152$	$\frac{1}{2}$
	$+\cdot1437$	$+\cdot7714$	$+\cdot1609$	$+\cdot115=0$	$+\cdot052$	
	$+\cdot1465$	$+\cdot7686$	$+\cdot1752$	$-\cdot286=0$	$-\cdot343$	

				Residuals.	Weight.
+ ·1518 x'	+ ·7627 π	+ ·2011 κ	+ ·176 = 0	+ ·120	
+ ·1624	+ ·7480	+ ·2534	− ·370 = 0	− ·417	
+ ·2119	+ ·6367	+ ·4743	+ ·095 = 0	+ ·096	
+ ·2558	+ ·4856	+ ·6308	− ·380 = 0	− ·336	$\frac{3}{4}$
+ ·2613	+ ·4639	+ ·6471	− ·055 = 0	− ·006	$\frac{3}{8}$
+ ·2723	+ ·4189	+ ·6774	+ ·057 = 0	+ ·116	
+ ·6179	− ·8058	+ ·0053	+ ·215 = 0	+ ·350	
+ ·6398	− ·7980	− ·1014	− ·530 = 0	− ·411	$\frac{1}{2}$
+ ·6427	− ·7959	− ·1153	− ·230 = 0	− ·113	
+ ·7106	− ·6747	− ·4268	− ·008 = 0	+ ·049	
+ ·7572	− ·5207	− ·6017	+ ·254 = 0	+ ·265	
+ ·7599	− ·5101	− ·6106	+ ·049 = 0	+ ·057	
+ ·7927	− ·3731	− ·7022	+ ·038 = 0	− ·061	$\frac{3}{8}$
+ ·8141	− ·2742	− ·7465	+ ·024 = 0	− ·019	
+ ·8143	− ·2735	− ·7468	+ ·419 = 0	+ ·376	
+ ·8335	− ·1805	− ·7748	− ·582 = 0	− ·642	$\frac{3}{4}$
+ ·8364	− ·1663	− ·7780	+ ·056 = 0	− ·006	
+ ·8522	− ·0872	− ·7910	+ ·195 = 0	+ ·120	$\frac{3}{4}$
+ ·8523	− ·0865	− ·7911	+ ·322 = 0	+ ·247	$\frac{3}{9}$
+ ·8609	− ·0435	− ·7947	− ·281 = 0	− ·362	
+ ·9205	+ ·2536	− ·7531	− 1·216 = 0	− 1·332	$\frac{1}{2}$
+ ·9261	+ ·2801	− ·7434	− ·777 = 0	− ·895	
+ ·9598	+ ·4318	− ·6639	+ ·562 = 0	+ ·435	
+ ·9624	+ ·4427	− ·6564	+ ·827 = 0	+ ·699	
+ ·9789	+ ·5091	− ·6044	+ ·381 = 0	+ ·251	
+ 1·0233	+ ·6155	− ·4916	+ ·217 = 0	+ ·090	

The normal equations deduced from these by the method of least squares are, after making allowance for the weights:—

$$
\begin{array}{rrrrrl}
+27{\cdot}250\,x & +16{\cdot}223\,x' & +4{\cdot}0258\,\pi & -8{\cdot}1716\,\kappa & +1{\cdot}0844 & =0, \\
+16{\cdot}223 & +12{\cdot}708 & -\,{\cdot}1377 & -8{\cdot}3986 & +\,{\cdot}77684 & =0, \\
+\;4{\cdot}0258 & -\,{\cdot}1377 & +8{\cdot}5200 & +1{\cdot}6929 & +\,{\cdot}85405 & =0, \\
-\;8{\cdot}1716 & -\;8{\cdot}3986 & +1{\cdot}6929 & +8{\cdot}6527 & -\,{\cdot}78159 & =0.
\end{array}
$$

From which we obtain—

$$
\begin{aligned}
x &= +0''{\cdot}0185 \pm 0''{\cdot}14, \\
x' &= +0{\cdot}0076 \pm 0{\cdot}27, \\
\pi &= -0{\cdot}1371 \pm 0{\cdot}11, \\
\kappa &= +0{\cdot}1420 \pm 0{\cdot}18.
\end{aligned}
$$